1036-84 The "R on T" Phenomenon During Supraventricular Extrasystoles: Fact or Fiction?

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Ventricular extrasystoles falling during the vulnerable period (VUL) of the prior cycle ("R on T" phenomenon) may set the stage for ventricular arrhythmias (VA). Whether this phenomenon can also occur with supraventricular extrasystoles has not been well established. We investigated this in a canine pacing study, during normally conducted beats (NQRS) and beats with right and left bundle branch block (RBBB/LBBB) in 3 groups of 10 dogs. Catheter ablation was used to produce BBB. After sinus node crush, 3 atrial pacing protocols (burst, single premature, short-long-short methods) were used to achieve the shortest R-R intervals at baseline (BASE) and on isoproterenol (ISO). Using intracardiac catheters, 0.8–1.2 W/s shock was delivered 60 ms after the end of T_1 and scanned decrementally until VA was induced, defining the outer zone (OZ) of VUL.

Results: The shortest interval between OZ-VUL and R_2 (ms) were:

	NQRS		RBBB		LBBB	
	BASE	ISO	BASE	ISO	BASE	ISO
Burst	47 ± 20	38 ± 26	19 ± 22	7 ± 26	23 ± 28	24 ± 18
Premature	29 ± 19	35 ± 19	−2 ± 19	1 ± 17	7 ± 24	10 ± 21
S-L-S	31 ± 17	38 ± 26	5 ± 20	−9 ± 24	26 ± 30	23 ± 21

R_2 could be advanced within VUL of R_1 in 11 dogs with BBB, but always after the upstroke or peak of T_1. No VA was induced by the pacing protocols alone.

Conclusions: 1. The "R on T" phenomenon could be demonstrated in this experiment but only when BBB was present. This may be due, at least in part, to the lengthening of repolarization during BBB which allows R_2 to fall within the VUL of R_1. 2. These data may have clinical relevance, particularly when low-energy atrial defibrillation shocks are coupled to the QRS complexes with varying preceding R-R intervals.

1037 Radiofrequency Catheter Ablation and Other Therapeutic Approaches to Atrial Fibrillation and Flutter

Wednesday, March 27, 1996, 3:00 p.m.–5:00 p.m.
Orange County Convention Center, Hall E
Presentation Hour: 4:00 p.m.–5:00 p.m.

1037-1 Successful Radiofrequency Catheter Ablation of Common Atrial Flutter During Sinus Rhythm

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In patients (Pts) with intermittent atrial flutter (AFl) referred for radiofrequency (Rf) catheter ablation (CA) of the inferior vena cava-tricuspid isthmus (IVC-TR), clinical AFl may be difficult to induce, a fibrillation may be the triggered arrhythmia. Because the target is anatomically defined, CA during sinus rhythm (SR) should be possible, but to date criteria for predicting late success are lacking. Based on our previous experience, we tested the ability of Rf pulses to create complete bidirectionnal block (Bl) in the IVC-TR isthmus in Pts in whom AFl could not be induced. Evidence of creation of Bl was provided by comparing changes in impulse propagation before and after Rf delivery when pacing on both sides of CA site. This was assessed by multiple points recordings (mean = 26) at the lateral right atrial wall (LRA), IVC-TR and coronary sinus ostium (CSOs) areas and interatrialseptum. CA during SR was performed in 10 Pts (Gr I; 9 males mean aged 59.6) and pursued in SR after Rf Afl interruption but without evidence of Bl in an additionnal 14 pts (Gr II; 11 males, mean aged 54.7). *Results:* In all 10 Grl Pts prior to CA, CSOs pacing resulted in a clockwise wavefront propagating via IVC-TR to LRA, and in a counterclockwise front propagating upwards to the His bundle and the high RA, with resulting mid LRA impulse collision. Inverse observations were made with low LRA pacing. Isthmus Bl was demonstrated using pacing techniques showing a wavefront propagating in a single direction from the pacing site, but not anymore crossing the CA site in 5/9 Gr I Pts after 6.8 ± 4.8 Rf pulses (2–15) and in 11/14 Gr II Pts after 13.3 ± 10.3 Rf pulses (2–24). Detailed IVC-TR mapping showed incomplete Bl in 7 Pts with IVC-TR delay, LRA displacement of collision but still IVC-TR impulse crossing during PCS pacing. After a 14 weeks follow-up, reccurences were observed in only 2/24 Pts in whom complete Bl could not be obtained. *Conclusion:* Attainment of IVC-TR complete Bl as evidenced by careful IVC-TR mapping is feasible during SR.

1037-2 Technology and Method for the Creation of *Left Atrial Endocardial Linear Lesions* to Ablate Atrial Fibrillation

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Previously we have shown an effective method and technique for the creation of right atrial linear lesions. In this investigation we developed a similar method and technique to create linear lesions in predetermined left atrial (LA) territories for the ablation of atrial fibrillation (Afib). The ablation system consists of a 7F catheter, a guidewire (GW), and a 12F sheath. The catheter has 22 4 mm ring electrodes (spaced 4 mm apart) and a monorail ring at its tip. The GW has a floppy tip with a small bulge proximal to this tip. The sheath is 73 cm long and has a 30º bend at its tip.

Methods & Results: In 4 dogs with sustained Afib, a Brockenbrough atrial transeptal system was used to introduce the sheath into the LA. The GW was inserted and positioned within the LV or a left pulmonary vein (PV). The catheter was advanced inside the sheath over the GW into the LA (with the GW feeding through the monorail). By pulling back the GW, the catheter was deflected to form a variety of vertical and horizontal loops of various sizes and shapes within the LA. Positioning was guided via fluoroscopy and transesophageal echocardiography (TEE). Three continuous transmural linear lesions were generated with RF power (20–30 watts) applied through each ring electrode: #1) vertical, from the mitral ring (MR) to the PV's up medially to the LA appendage; #2) vertical, from the MR to the PV's up laterally to the LA appendage; #3) horizontal, in the mid-atrium perpendicular to #1 & #2 under the PV's. Bipolar recording using each of the ring electrodes showed distinct organization in the Afib character as the lesions were generated. Afib became non-inducible after lesion #3. Total lesion application time was 2 hours. *Conclusions:* This system can be used to efficiently create linear transmural LA lesions to ablate Afib. It holds promise for the ablation of Afib in humans.

1037-3 Radiofrequency Ablation of the Atrium Using Sequential Coil Electrodes

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Radiofrequency (RF) ablation of atrial fibrillation is thought to require multiple long linear lesions. These types of lesions are difficult to generate with 4 mm electrodes. The purpose of this study was to determine the lesion size created with multiple sequential coil electrodes. In 8 dogs, a catheter with four 0.5 cm electrically isolated coil electrodes was positioned in the right or left atrium via the venous system. For left atrial lesions, a transeptal approach was utilized. The RF generator had a maximum output of 50 watts and had a closed loop temperature control system. The target temperature ranged from 70–85ºC and the RF energy was applied to each coil individually for 60 sec. Therefore, 4 applications of RF were required to make a full length lesion. 20 full length lesions were generated with a mean lesion volume of 131.6 ± 77.3 mm^3 (depth 1.7 ± 0.9 mm, width 6.2 ± 1.2 mm, length 21.9 ± 3.9 mm). The mean temperature of these applications was 71.9 ± 6.3ºC and was achieved with 17.7 ± 10.1 watts. Seventy percent of the lesions were transmural throughout the length of the lesion. There were an additional 10% of lesions in which the lesion was transmural throughout part of the length of the lesion. During these 80 applications of energy (20 full length lesions) 4 were associated with coagulum formation. Coagulum formation never occurred with target temperatures < 85ºC. In conclusion, these results demonstrate the feasibility of using multiple sequential coil electrodes to generate long linear transmural atrial lesions. With this closed loop temperature control system, coagulum formation are infrequent and are associated with high (≥ 85ºC) target temperatures.

1037-4 Results of Linear Right Atrial Radiofrequency Ablation With a Temperature Controlled, Multiple Coil Electrode Catheter

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We hypothesized that 1) continuous linear radiofrequency (RF) ablation lesions could be created in the right atrium (RA) and 2) atrial activation mapping could predict successful lesion formation and location.

Methods: Six mongrel dogs were anesthetized and a jugular vein, femoral artery and vein were cannulated. RA activation was mapped (unipolar, 1–1000 Hz) during sinus rhythm and RA pacing from 2 sites using a 64 electrode basket mapping catheter (EP Technologies). Sequential temperature-controlled RF lesions were created with an 8 Fr multiple coil electrode catheter (EPT) to produce a continuous ablation from the superior to the inferior vena cava. RA activation mapping was repeated. Conduction block was defined as > 20 ms delay in > 2 contiguous mapped sites.